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# SCREW-WORMS AND OTHER MAGGOTS AFFECTING ANIMALS

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Screw-worm fly, much enlarged.

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THE SCREW-WORM is an important pest of nearly all stock in the Southwest. In some sections the rearing of young calves is practically prevented by its ravages. Some grown stock are killed outright and some are maimed permanently, while infested sheep always lose flesh and their milk production decreases. The expense of watching herds and treating infested animals also is considerable.

Several kinds of flies infest wounds and blow soiled wool on sheep. These flies may occur in any part of the United States.

All of these flies breed in decaying animal matter, especially in carcasses of large animals. If all dead animals could be disposed of properly, no cases of infestation of living animals would occur.

Complete destruction of carcasses by burning is the approved method. This lessens danger of the spread of such diseases as anthrax and tuberculosis from animal to animal in pastures and prevents all breeding of flies in carcasses. If burning can not be carried out properly, bury carcasses, covering them with at least 2 feet of soil. Apply a liberal quantity of quicklime prior to covering, especially if a possibility exists that the animal died of some contagious disease.

Other steps to prevent infestation are avoiding injury to stock, having calves come when flies are not abundant, destroying ticks, performing surgical operations in winter or early spring, and poisoning or trapping flies. To prevent attack of the wool-maggot, lamb early, avoid diarrhea, tag sheep if dirty, and breed hornless types.

In treating stock watch for the first signs of infestation, use chloroform to kill maggots, and follow with pine tar to repel flies.

For further information about the screw-worm fly and other flies infesting wounds, with accounts of their habits and the methods of controlling them, consult the following pages.

# SCREW-WORMS AND OTHER MAGGOTS AFFECTING ANIMALS.[1]

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THE so-called screw-worm[2] is a pest of prime importance to the stock raisers of the Southwest. This insect gains its common name from the habit of the larvæ or maggots of penetrating practically sound tissue. Stockmen usually distinguish between the screw-worm and what they term maggots largely by the character of the wound infested and the time of year. The screw-worm is often confused with the other species, which commonly are spoken of as maggots, especially during the spring and fall months. Injury to live stock from maggots is more widespread than is that due to the true screw-worm. In fact, this maggot injury may be found among live stock in any State of the Union, although it occurs most frequently in the warmer portions of the country. The true screw-worm inflicts enormous losses on the stock raisers of Texas, Oklahoma, New Mexico, Arizona, and southern California during seasons which are favorable for its development. During the warmer portions of the year it is never entirely absent from this region and may also cause injury to stock in the other southern States, and as far north as Nebraska.

The screw-worm is a native of the Americas and has been causing trouble to stockmen for many years. No doubt it is largely due to this fact that the cattlemen accept the pest as a necessary evil and always count upon "doctoring" a certain number of cases every year.

## DISTRIBUTION AND ABUNDANCE OF THE SCREW-WORM.

The screw-worm fly occurs from the extreme southern part of South America northward into Canada, but it seldom becomes

[1] Throughout the investigations upon which this bulletin is based Mr. E. W. Laake has been associated with the authors. He was concerned especially with work on the life histories of the various animal-infesting flies, details of which will be published later. The photographs, except that of figure 5, were made by Mr. H. P. Wood.

[2] Known scientifically as *Chrysomyia macellaria* Fabricius.

abundant in the Northern States, and the fly itself is killed quickly by cold weather. Since 1843 it has been of more or less importance nearly every year in what are now the Southwestern States. At times it has become a serious pest farther to the north and east. For instance, in 1890 a rather severe outbreak was experienced in Louisiana and Mississippi, and very frequently it causes much annoyance to stock in Kansas.

In the Southeastern States cases of screw-worm injury are infrequent.

The seasonal abundance of the screw-worm fly depends largely upon climatic conditions. The first appearance of adults in numbers in spring varies from the first of April to the middle of June, according to the latitude and earliness or lateness of the season. Throughout most of the territory where it is a pest it usually becomes numerous during early May, and cases of screw-worm injury begin to appear soon after. The insect then gradually increases in numbers until the hot, dry weather of midsummer, which in Texas usually reduces the abundance so that the injury is not severe under normal conditions in the months of July and August, unless considerable cloudy and rainy weather occurs. It becomes more numerous again in the early fall, especially when the weather is warm and showery, and its activities are terminated only with the advent of heavy frosts. The abundance of this fly, of course, is dependent to a large extent upon breeding places at hand, but it is also true that a warm, humid atmosphere is best suited to its development.

## CHARACTER OF INJURY AND LOSSES DUE TO THE SCREW-WORM.

Practically all animals are more or less subject to attack by the screw-worm. Probably cattle suffer most, with hogs, horses, mules, sheep, goats, and dogs following in the order named. Wild deer and many of the smaller mammals sometimes are seriously infested. Numerous cases of infestation of human beings have been recorded, and probably thousands of such cases have not been reported.

In man the nose and throat are most commonly infested, the cases occurring usually among individuals who suffer from chronic catarrh. Minor wounds on various parts of the body also are infested.

Among live stock the most common form of attack follows minor skin injuries, such as cuts by barbed wire and scratches from brush or from hooking. Sometimes calves are attacked by the worms at the time of birth. In these cases the screw-worms may enter on various parts of the body, but most commonly at the navel, where they penetrate with ease. If not promptly treated, the calf may die. Later in the life of the calves it is not infrequent to find infestations of the mouth, in some cases resulting in the loss of teeth or death.

Cows frequently are infested on regions where blood collects at the time of calving. Where ticks are abundant, a common source of infestation is through the deposition of eggs on blood spots resulting from the crushing of engorged ticks. Most of the other infestations occur following surgical operations such as dehorning, castration, branding, etc. Some cases follow serious attacks of biting flies such as the horn fly, stable fly, and horseflies. The blood oozing from the punctures made by these flies attracts the screw-worm fly. Among hogs the worms usually gain entrance about the ears and head through scratches made in fighting.

In cases which are not treated the injury is gradually made worse by repeated laying of fresh eggs, the number of maggots being increased enormously. In such instances the animals lose appetite immediately, become emaciated, and hide away in the brush or some out-of-the-way place. This habit increases the chances of loss by death, especially where the ground is covered by heavy chaparral.

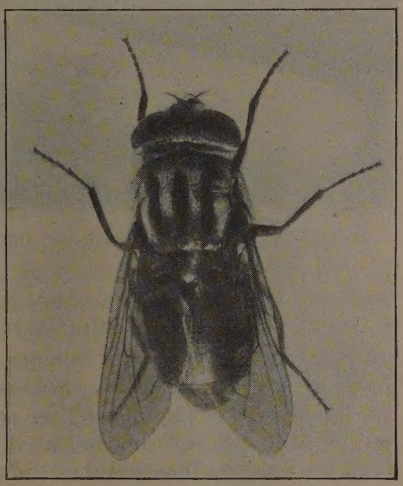

FIG. 1.—Screw-worm fly as seen from above. Much enlarged.

While the death of animals is not infrequent, the major portion of the loss is due to the reduction of flesh, the time required for riding ranges and treating animals, and the money spent for screw-worm medicines. During the summer of 1914 the screw worms were so bad that many ranchers employed from 1 to 10 extra men, who were kept busy almost continuously on this line of work from May to November. A further loss of no small amount results from the practical prohibition of the breeding of cattle in certain districts, especially in parts of southwestern Texas, where stockmen have practically discontinued the attempt to raise calves and are buying up yearlings or other older animals and bringing them in for grazing.

## DESCRIPTION OF THE SCREW-WORM FLY AND ITS OFFSPRING.

All flies pass through the following four changes in the course of their lives: (1) The adult or mature insect, (2) the egg, (3) the larva, which is known as the maggot or worm, and (4) the pupa, which is an inactive stage in which the change from the maggot to the adult fly takes place. The pupa stage corresponds to the chrysalis

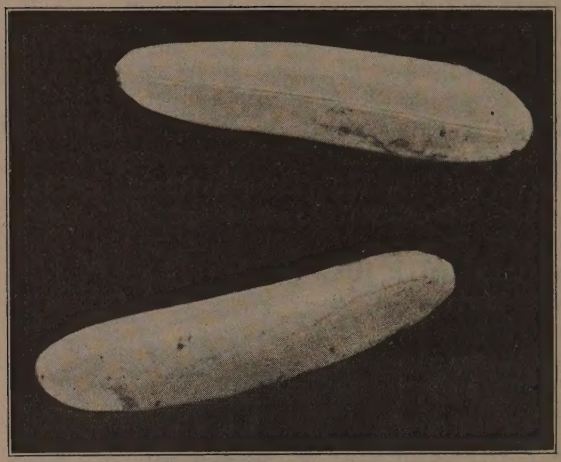

FIG. 2.—Eggs of the screw-worm fly. Greatly enlarged.

of a butterfly. A few kinds of flies have the habit of retaining the eggs within the body until they hatch and then depositing the minute but active maggots.

#### THE ADULT, OR FLY.

Of the flies that breed in wounds on animals, the screw-worm is of paramount importance, and all stockmen should learn to distinguish this fly from others. It is one of the most common of the so-called blowflies in the Southwest during the summer and fall months, although in the summer it is more or less common in practically all parts of the United States. Sometimes it is spoken of by observant stockmen as the "red-head," on account of the rather conspicuous red or yellowish-red coloring of the face. It is considerably larger than the common house fly, of a dark bluish green color, with three distinct black stripes on the back between the wings, as shown in figure 1 and on the title page.

#### THE EGG.

The eggs of the screw-worm fly are very similar in appearance to those of other blowflies. They are about a sixteenth of an inch long and creamy white in color. Most of them are somewhat curved and have a slightly projecting double ridge along one side. (See fig. 2.) They are laid in irregular masses, sometimes several thousand being deposited in a mass by a number of females.

#### THE LARVA, OR MAGGOT.

The maggots of the flies which infest wounds of

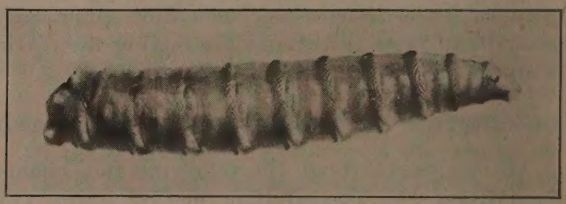

FIG. 3.—Screw-worm maggot, side view. Enlarged.

animals are all very similar in appearance. Ordinarily the differences among them can not be distinguished without a very careful examination under a microscope. Their habit of attack, however, indicates with some degree of accuracy whether they are screw-worms or some other species. All have the usual maggot shape and are nearly white. When newly hatched from the egg they are extremely minute and active, and when full grown they become nearly three-fourths of an inch long. While they have no legs, the body is fitted with minute spines and humps which enable them to crawl and aid them in working their way into an animal or any material upon which the flies are breeding. The head end is rather pointed and provided with two stout black hooks which are used in tearing the food. The larger or tail end is provided with two brownish plates through which they breathe. (See fig. 3.) It is this portion of the maggot which is seen when one observes a mass of them in a wound.

### THE PUPA.

The pupa, or resting stage, usually is to be found in the ground. The pupæ are somewhat barrel shaped, with the ends rounded. They are about one-third of an inch long. (See fig. 4.) At first they are yellow, but later they turn to a rich brown color. When the fly within is mature it splits one end of the shell and crawls out.

FIG. 4. — Pupa, or resting stage, of the screw-worm. Enlarged.

### LIFE HISTORY AND HABITS.

With the advent of warm weather the flies appear and begin breeding in any available decaying animal matter. The question of where screw-worm flies breed is one of greatest importance to stockmen. Many are of the opinion that they do not breed in carcasses, but aside from the few which mature in living animals this is the only medium in which breeding occurs.

The life of the adult fly is comparatively short, ranging from two to six weeks. The flies feed upon various kinds of refuse and to some extent upon the nectar of flowers. When food is not at hand and the temperature is high the flies usually die in from 24 to 48 hours. Eggs are laid in batches from one to four days apart, each mass containing from 40 to 250 eggs. A single female is capable of depositing as many as eight batches of eggs, the total number in one case being 1,228.

FIG. 5.—Screw-worm flies on weed near carcass. All vegetation around this weed was covered in a similar manner. Considerably reduced.

The eggs are deposited almost exclusively upon dead animals and in wounds. The flies show a marked tendency to visit fresh carcasses rather than old ones; this is true also to some extent with the infestation of wounds. The eggs hatch in from less than four hours when the weather is moist and warm to about two days when surroundings are less favorable. The condition which exists in fresh wounds is very favorable for incubation, and the eggs probably hatch within three hours after deposition in such situations.

As soon as the eggs hatch, the young larvæ begin penetrating the carcass, or if on living animals they start burrowing into the flesh. While undergoing development in a wound the larvæ tear the softer portions of exposed flesh with their stout jaws and excrete an irritating substance which probably assists in breaking down the tissue. When the maggots are working in a deep wound they release their hold on the flesh at intervals and come to the surface, where they lie with the breathing pores exposed. If disturbed while at the surface, they return at once to the deeper portions. The injury to the infested animal is not due entirely to the eating away of the tissues, but also to the toxic material resulting from the presence of the maggots in the wound, which may result in general poisoning of the system of the animal.

The worms grow very rapidly and in living animals are mature and drop from the wound in from four to five days. In carcasses they do not mature quite so rapidly (6 to 20 days) unless the weather is hot and damp. The grown maggots burrow into the ground to a depth of from 1 to 4 inches and soon contract, becoming first yellowish and then brown, the outside skin forming a hard protective covering. This is known as the pupa stage. The flies emerge from these pupæ in from 3 to 14 days and soon are ready for egg laying. (See fig. 5.) The entire life cycle is completed in from one to four weeks, depending on the temperature and humidity.

The multiplication of screw-worm flies would be enormous if carcasses for their breeding were present. Careful estimates indicate that as many as a million flies may be produced from the body of a single cow.

## CONTROL.

The importance of destroying carcasses of all sorts of animals cannot be overestimated. If all dead animals could be burned within a few days after death, trouble from screw-worms in living animals would be unknown. It is realized fully that the obstacles to the carrying out of this method of control are many.

### BURNING OR BURYING CARCASSES.

*The complete destruction of all dead animals by burning is by far the best method of control.* This not only stops the breeding of all blowflies but helps to prevent the dissemination of such dangerous diseases of live stock as anthrax or charbon, blackleg, and hog cholera.

The method of burning carcasses depends to some extent upon the locality. Where wood is at hand, the expense is almost negligible. It is desirable that carcasses be burnt without moving them, and *in cases of death from anthrax this is imperative.* The simplest plan is to place some wood on the ground and turn the animal over on top of it, adding fuel until the carcass is completely consumed. Burning can be facilitated by digging a small trench, placing the animal on iron rails across it, and keeping fire beneath it. If the ground is firm, the irons are not essential. A very satisfactory method where stable manure is at hand is to place a large load of dry manure on top of the carcass and set it afire. This burns slowly and usually the animal is entirely destroyed without further attention. In some districts the use of crude oil or kerosene and a small quantity of wood makes the burning quick and inexpensive. It is important that the entire carcass be consumed, as a body charred on the outside will often be more effective in breeding screw-worms than if it had not been burned at all. Complete destruction is essential also to control disease.

If burning is impracticable, carcasses may be buried. It is necessary to cover the top of the maggot-infested carcasses with at least 2 feet of closely packed soil to prevent the escape of flies. If no eggs are deposited on a dead animal it is not necessary to bury it so deep, but it is desirable to cover it well to prevent dogs or other animals from digging it up. The free use of quicklime on the carcass before covering it will destroy some of the maggots and disease germs.

If it is absolutely impossible to burn or properly bury a carcass, many maggots can be destroyed, especially during the hot, dry weather of midsummer, by exposing the carcass in the sun. Dragging an animal into a creek bottom and leaving it in the shade of brush and trees is most conducive to screw-worm propagation. Some have suggested the cutting up of a carcass and scattering it about so as to hasten its drying. This would cause the destruction of some flies by the heat and would enable birds and other natural enemies to destroy some of the maggots, but it is really not a commendable practice.

Animals found dead in water holes should be removed at once and destroyed. Screw-worm breeding will go on unless the body is submerged completely, and there is great danger of contaminating the water with disease which may kill many healthy stock.

### AVOIDING SCREW-WORM ATTACK.

Some slight modifications in the range or farm methods of handling live stock will tend to reduce the number of screw-worm cases.

#### CONTROL OF TIME OF CALVING.

Even in the most heavily infested districts, losses from screw-worms at calving time can be largely avoided by having the calves drop between December 1 and the middle of April. In the northern portions of the screw-worm district this time can be extended from about November 1 to June 1. Of course this changes the present common range practice of allowing bulls to remain with the herd continuously, and its successful prosecution would depend to a large extent upon having some feed at hand for use during the calving period.

#### TIME FOR BRANDING, MARKETING, CASTRATING, AND DEHORNING.

Under present conditions most cattlemen avoid branding and castrating during the period when screw-worms are most abundant. If all of these operations could be carried out between December 1 and May 1 very little trouble from screw-worms would follow, but the period for dehorning should be shortened to avoid maggot infestation as explained on page 4.

By rubbing a small quantity of cottonseed oil containing 4 per cent of carbolic acid over the burn immediately after branding, healing is hastened and the scab peels off smoothly.

#### AVOIDANCE OF INJURY TO STOCK.

It is important that all forms of injury which induce screw-worm infestation be avoided during the summer months. Greater care

exercised in handling cattle will result in fewer scratches and bruises. Systematic dehorning of all cattle will largely prevent one source of injury, namely, that from hooking. This also tends to prevent some barbed wire and other scratches which result from animals endeavoring to escape the horns of others.

It is important that all corrals and pens be examined occasionally and projecting points, nails, and wire likely to cause injury to stock removed. A few minutes spent in this way will often save hours in treating screw-worm cases. Where practicable, smooth or woven wire should be substituted for barbed wire.

### CLEARING OF PASTURES.

Since dense brush and undergrowth are favorable to screw-worm breeding, every effort should be made to improve this condition. While clearing of lands is more applicable to small pastures, some large stock raisers now have cleared thousands of acres of the most dense undergrowth. This procedure increases the grass production, makes the finding of dead animals or wormy animals more easy, and facilitates the handling of stock on the ranges.

### DESTRUCTION OF TICKS.

A large percentage of screw-worm infestation follows tick attacks. Where systematic dipping for ticks is carried out, the number of cases of screw-worms is materially reduced. Heavy infestations of ticks other than the cattle tick [1] often are followed by an infestation of screw-worms. This is true of the Gulf Coast tick,[2] which attacks the inside of the ears of horses, mules, and cattle. While the usual system of dipping will not completely destroy this and ticks other than the cattle tick, it will reduce their numbers markedly. Furthermore, where cattle infested with screw-worms are dipped in an arsenical solution, many of the maggots are killed.

### POISONING AND TRAPPING FLIES.

As supplementary measures for reducing the number of screw-worms and other blowflies, flytraps such as the hoop trap recommended by the Department of Agriculture (see Farmers' Bulletin 851) and certain poisoned baits may be utilized. By placing these traps in convenient places in the pasture, particularly near watering places, where they may be visited occasionally by riders, a large number of adult flies can be destroyed. It is best to place them on a platform slightly larger than the trap, on the side of a tree or on top of a post from 3 to 5 feet from the ground and in a place protected

[1] *Margaropus annulatus* (Say). [2] *Amblyomma maculatum* Koch.

from strong winds and the sun. They may be baited with carcasses of freshly killed animals such as rabbits or prairie dogs. The bait should be changed every three or four days to prevent maggots from breeding in it, and the flies should be killed and emptied when the trap becomes too full.

Most liquid poisons evaporate so rapidly that they are of little use under range conditions. Where dead animals can not be promptly burned or buried it is possible to kill a large number of flies by using the carcasses as poisoned baits. The animal should be partially skinned, the flesh slashed, and a solution of arsenic made by boiling 1 pound of white arsenic in 5 gallons of water applied freely to the flesh. This method has been recommended by Prof. W. W. Froggatt in combating the sheep-maggot flies in Australia. He says that an animal will remain attractive for a couple of days only, owing to the hardening action of the arsenic on the flesh. The animal then may be turned over and treated the same way on the other side, after which it may be buried, or, if this is impossible, fly breeding is prevented by the action of the arsenical solution, and it is said that birds and animals will not touch the carcass. Small wild animals killed in pastures may be used as poisoned baits in the same way.

### TREATMENT OF INFESTED ANIMALS.

It is important that herds be watched carefully during the screw-worm season so that all cases of infestation may be detected early. Those familiar with screw-worm injury have very little difficulty in telling if a wound is infested. Usually there is a free discharge of watery blood and a fresh appearance to the wound. In handling these cases on ranches it is best to have a small pasture, usually called a "trap," close to headquarters, where all infested animals are kept until the wounds are completely healed.

The construction of large cages of screen wire or netting such as shade cloth, used in covering tobacco, has been found practicable for the protection of valuable calves born in the screw-worm season. Moreover, such cages are useful for protecting injured stock from infestation or for allowing wounds already infested to heal following treatment without suffering further attack.

For destroying the maggots in a wound nothing better than chloroform has been found. One of the principal advantages of this material is that it evaporates freely and penetrates to the deeper parts of a wound. If the infested place has a comparatively small hole at the skin, but is deep, it is a common practice to pour chloroform into it and then plug the hole. In most cases it is desirable to remove the dead or comatose maggots with a pair of forceps, clean

the wound out with water containing 5 per cent carbolic acid, and apply pine tar to act as a repellent for flies. Tannic acid dusted over the wound will check bleeding and make it less attractive to flies. When a wound is severe it is best to call in a competent veterinarian, especially if the infested animal is a valuable one. Turpentine, kerosene, gasoline, cobalt solution, and ether have been used with greater or less success. The former extensive use of calomel in wounds is now practically discontinued.

When it is necessary to perform any surgical operation during the fly season it is best always to apply some fly repellent. Tannic acid followed by an application of pine tar or some of the cresol dips will be found of value for this purpose.

## OTHER FLIES INFESTING WOUNDS, INCLUDING THE SHEEP WOOL-MAGGOTS.

The screw-worm fly[1] is the only species in this country the larvæ of which penetrate the sound tissues of living animals. Four or five other kinds of flies have been bred from maggots taken from wounds of different types and also from soiled wool on sheep. With all of these flies there seems to be less tendency to attack fresh wounds, the attraction for them increasing as the wound becomes foul and bad odors develop.

### INJURY AND LOSSES DUE TO MAGGOTS.

The injury produced by various species of fly larvæ other than the screw-worm may be divided into two classes; (1) those which attack wounds and (2) those which infest the wool of sheep, commonly spoken of as wool-maggots. The same insects may be concerned in both of these. The first type of infestation usually is to be found in large wounds or old sores. Probably the most common place of attack is in the heads of animals following dehorning, and any old festering sore may become infested. When maggots become established after dehorning, the healing process usually is greatly delayed, but it is not usual for animals to die, especially if they receive some attention. The loss due to the wool-maggot is of considerable importance. While it probably is greatest in certain sections of the Southwest, this class of injury is not uncommon in the Central States and California. One of the most serious problems with which the sheep raiser in Australia has to deal is very similar to this one, although in that region the number of different species of maggots attacking the wool of sheep is much greater and the infestation of

[1] Ox warbles cut through the unbroken skin, but the injury produced by them is entirely different from that discussed here.

flocks is more general. In this country, while a few cases occur nearly every year following lambing, it is only when favorable weather conditions prevail that the injury becomes serious. In such cases a large percentage of ewes may become infested about the rump following lambing. Some are killed outright, nearly all are cut down in flesh, and the loss in wool sometimes amounts to nearly half of the entire clip on the ewes infested. The cost of treatment and material used in destroying the maggots is considerable under such conditions.

Another common place of attack by these maggots is in the wool surrounding the horns. The blowing is usually started by the presence of slight injuries around the horns caused by fighting. Some cases of maggots follow the soiling with excrement of the wool about the vent. This usually occurs when sheep are sick and have diarrhea.

The eggs are laid on the soiled wool, and the small maggots upon hatching work into the wool. Many of them feed next to the skin, and soon the wool is loosened in large patches and the skin made red and raw. The odor from the infested area is strong, and other flies are attracted to deposit their eggs. As the irritation increases the flesh is entered, and the sheep often die.

### SPECIES OF FLIES INVOLVED.

#### THE BLACK BLOWFLY.[1]

The fly which is responsible for most of the trouble from wool-maggots, especially in the Southwest, is the black blowfly. It is the maggot of this fly which is commonly found in old festering sores and following dehorning, except when this operation is done during the summer time in the Southwest, when the screw-worm is the species concerned.

This fly usually becomes active during warm days in the winter and multiplies rapidly in the early spring, but the hot dry weather of summer soon reduces its numbers so that in the Southwest it may disappear completely for a few months. It again increases in numbers during the fall, and after about November 1 largely takes the place of the screw-worm fly as a carrion breeder.

The adult is about the same size as the screw-worm fly, but it is greenish-black in color and has no stripes on the back. (See fig. 6.) It should not be confused with the large hairy blowfly [2] or the bluebottle flies,[3] which are often seen in or around houses during the fall,

[1] *Phormia regina* Meigen. [2] *Cynomyia cadaverina* Desv. [3] *Calliphora* spp.

winter, or early spring months. These blowflies usually are larger in size, more hairy in appearance, and have grayish colored thoraxes and dark-blue or silvery blue abdomens.

The breeding habits of the black blowfly are very similar to those of the screw-worm fly. It is exclusively a flesh breeder, but occasionally it may develop in very old decaying carcasses. The eggs, which are deposited in masses, hatch in from less than 24 hours to 4 days. The maggots become fully developed in 3 or 4 days after hatching and begin to crawl away and burrow into the earth. The pupa stage lasts from 7 to 10 days, and after the fly emerges a week or more usually elapses before the first eggs are laid. On living animals the rate of development is probably somewhat faster. By this rapid breeding the flies may become very abundant during the early fall before cold weather sets in.

### THE GREEN-BOTTLE FLY.[1]

The green-bottle fly has a wide distribution throughout the world. It is known as the green-bottle or green blowfly in this country. It is rather closely associated with habitations of man and is not as commonly found on the range as are the screw-worm fly and the black blowfly. It is often abundant in cities, especially if garbage is not properly cared for.

This is the fly which causes the wool-maggot of sheep in the British Isles, and the same habit has been recorded for it in this country. It has been known to deposit eggs on the soiled rumps of calves as well as sheep, following diarrhea, and occasionally it infests wounds on animals, but it is not as injurious as are the two species previously described.

FIG. 6.—The black blowfly or common wool-maggot fly of the United States, as seen from above. Enlarged.

It is usually slightly smaller than the black blowfly and the

[1] *Lucilia sericata* Meigen.

FIG. 7.—The green-bottle fly. Enlarged.

screw-worm fly. (See fig. 7.) Its color ranges from a brilliant bluish green to a dark metallic bronze green. It is without stripes or other markings.

The adult flies usually appear during the first warm days of spring and are present throughout the summer, though they seldom become as numerous as the screw-worm fly or black blowfly. The length of time required for development is about the same as that required by the black blowfly. The maggots breed exclusively in animal matter.

### THE GRAY FLESH FLIES.

There are two or more species[1] of this group of flies which occasionally breed in living animals, apparently attacking only old festering wounds. They are of comparatively little importance, and since there are a great number of different kinds of flies of this group, some of which are not at all injurious, it is hardly necessary that the stockmen learn to recognize them. Their size varies considerably from a little larger than the common house fly to somewhat larger than the black blowfly. The color usually is uniformly gray, with black stripes on the back. One of these flies is shown in figure 8.

Many of the members of this group of flies retain the eggs in the abdomen until they hatch, and thus bring forth living maggots. Those species which attack living animals breed in decaying animal matter and their life history is almost the same as that of the screw-worm fly. The flies seldom become very numerous, and in most of the cases in which they are found in living animals they are located in old festering wounds or the young are deposited after a sore has become infested by screw-worms. These flies seem to be able to withstand the hot, dry weather of midsummer in the Southwest and probably are responsible for many of the cases of infestation of animals during such periods.

### METHOD OF CONTROLLING MAGGOTS.

The black blowfly, the bluebottle fly, and the flesh flies are carrion breeders. They attack wounds on living animals mainly as a result of the presence of the flies in abnormally large numbers. Therefore it

[1] *Sarcophaga texana* Aldrich, *S. tuberosa* var. *sarracenioides* Aldrich, and *S. robusta* Aldrich.

is clear that practically all of the methods of control recommended for the screw-worm are equally applicable to the other species of noxious flies. To prevent the breeding of the black blowfly it is essential that carcasses be burned or buried, even during the winter months. Thus the proper disposal of carcasses becomes of much importance all the year. Where these flies become a nuisance by contaminating food products or by entering houses, which is usual in towns or cities, attention must be given to the proper disposal of garbage, as they will breed in the meat scraps in garbage cans or on dumps as well as in carcasses.

### THE TREATMENT OF MAGGOTS IN WOUNDS.

To destroy maggots in sores the same method as for the screw-worm is to be followed. It is not always possible to prevent maggot infestation following dehorning, but if periods of cool weather in winter are chosen for this operation, usually no trouble follows. To prevent maggots from gaining entrance to wounds the application of pine tar is advised. Following dehorning, some advise covering the wounds with pieces of cloth dipped in pine tar. Many of these will remain in place several days.

The tails of lambs are sometimes infested by maggots following docking. This can be largely prevented by removing the tails with moderately heated pincers. The docking of lambs also tends to avoid soiling of the wool during succeeding months, and this helps to prevent infestation of the rump by maggots. Other important steps in preventing wool-maggot injury are the following: (1) Breed hornless sheep and thus avoid injury from horns and consequent infestation around them; (2) lamb as early in the spring as possible—considering other conditions; (3) shear either before lambing or as soon after as possible, and thus avoid the infestations which almost invariably follow in heavy-wool sheep when warm, humid weather comes on.

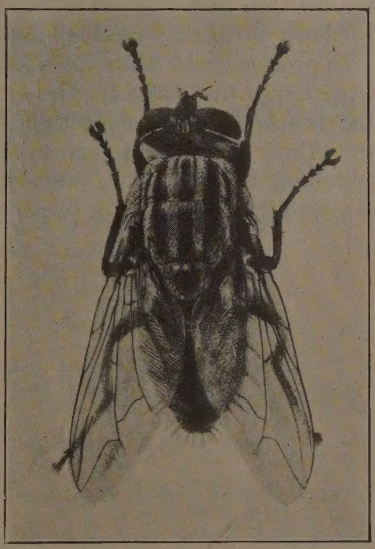

FIG. 8.—A gray flesh fly (*Sarcophaga* sp.) Enlarged.

In Australia very extensive work has been done looking toward the destruction of maggots in wool, but nearly all the remedies devised have serious objections, so that dependence must be placed almost entirely upon preventive measures. If sheep become infested, however, the wool should be clipped from about the portions containing the maggots. It is necessary to begin the clipping outside the infested area, so as to avoid driving the maggots back into the unsoiled wool and thus extending the trouble. When the maggots have been concentrated in a certain spot by clipping around them, the application of stock dip in concentrated form or the use of chloroform, especially if the infested area is covered immediately with a piece of oilcloth, will destroy the maggots, and the entire mass then can be clipped off. Mixtures of turpentine and tar have been tried in Australia for the destruction of wool maggots and the prevention of subsequent infestation, with a fair degree of success. It is important that something be applied to deodorize the infested parts and hasten healing. Some sheepmen use air-slaked lime dusted lightly over the parts to dry up the discharge and reduce the odor. This undoubtedly is accomplished to some extent, but there is some danger of forming crusts and having maggots infest the sore places or wounds beneath these.

On large sheep ranges, when the lambing is done during seasons which are favorable for infestations, it is best to have the flocks divided into rather small units and carefully watched, so that any fly-blown sheep may receive immediate attention.

To protect lambs and other sheep during the summer months from being blown by bluebottle flies an effort should be made to prevent diarrhea, and when sheep get dirty they should be promptly trimmed up. Apply to the rump, and to the parts fouled by diarrhea, grease containing a few drops of crude carbolic acid or tar oil. The grease will hold the tarry odor in suspense and act as a fly repellent.

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